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Monitoring the Environmental Impacts of USAID-Funded Activities to Conserve Biological Diversity

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Summary

This report was prepared as a discussion paper for a USAID workshop on environmental indicators held in Washington, DC at the end of March 1995. The report assesses the prospects for monitoring and measuring the impacts on biological diversity of field-level conservation and development projects financed by USAID that are designed to help protect and manage threatened habitats of regional or global conservation value. Several of these projects are beginning to systematically monitor their impacts by measuring site-specific ecological changes over time and linking observed change with project conservation and development efforts.

The monitoring experience of three projects is reviewed in this report: the Sustainable Approaches to Viable Environmental Management (SAVEM) project in Madagascar, the Biodiversity Conservation Network (BCN) working throughout Asia and the Pacific, and the Parks in Peril (PiP) project, which is working at several sites in Latin America and the Caribbean. The possibility is assessed of scaling up the results of these site specific monitoring efforts to measure the broader impacts of national, regional, and global programs.

MONITORING PROJECT-LEVEL IMPACTS ON BIODIVERSITY

The SAVEM project and the BCN are both encouraging the sustainable use of biological resources by rural communities living in or near threatened habitats of high biodiversity conservation value. Their ecological monitoring programs are primarily designed to determine whether and under what conditions rural communities that gain socio-economic benefits from intact forests and other ecosystems will better protect them and their biotic resources. To date, this hypothesis-testing approach to monitoring impacts has been most comprehensively developed by a SAVEM-funded consortium of U.S. and Malagasy institutions working in a lowland tropical forest park and buffer zone of the Masoala Peninsula in northeastern Madagascar.

In contrast, in the Parks in Peril project, ecological monitoring is being designed and implemented primarily as a site-specific management tool. The goal is to provide park managers with sufficient information to better assess the relative importance of different threats to biodiversity and the effectiveness of different management actions. Monitoring efforts with this "adaptive management" objective are furthest developed at the El Triunfo Biosphere Reserve, a mid-elevation-to-montane forest in the Sierra Madre de Chiapas, Mexico.

This report s assessment of these experiences and related monitoring efforts indicates that effective programs to monitor project-level impacts on biodiversity should have the following characteristics:

- The input of ecological expertise and financial resources at the earliest stages of the project is essential.
- Monitoring should be tailored to local conditions, since there are no standard sets of "cookbook" indicators and techniques that can be equivalently applied across different ecosystems and threats to their conservation.

- Indicators should be selected that can reliably reflect project impacts according to multiple ecological scales, since impacts at one scale (e.g., changes in forest cover) do not provide information about impacts on biodiversity according to other scales (e.g., changes in the populations of hunted species).

- Monitoring programs should establish baseline conditions and, where feasible, monitor changes in biodiversity at equivalent control sites that are unaffected by project activities.

- Programs should systematically assess the link between observed changes, project activities, and other potential causes of change.

- Programs should develop the local financial and technical capacity to continue monitoring impacts beyond the life of USAID project funding.

- The site-specific monitoring programs described in this report are innovative and contribute to the better design and management of conservation projects. They can be time-consuming and fairly expensive to establish and are therefore vulnerable to being cut back when project budgets tighten.

RECOMMENDATIONS FOR SITE-SPECIFIC MONITORING

It is recommended that USAID strongly encourage ecological monitoring programs through the following actions:

- Providing sufficient financial investment in site-specific projects to support their monitoring needs.

- Placing a strong emphasis on adaptive management and hypothesis-testing in biodiversity conservation projects, as opposed to an emphasis on producing results that "demonstrate success."

- Providing support for an international workshop that brings conservation practitioners together to compare ecological monitoring techniques, for the purpose of minimizing the level of "wheel-reinventing" now going on as a growing number of conservation projects develop monitoring programs.

Collectively, these steps should greatly increase the effectiveness of site-specific biodiversity conservation projects and ultimately may substantially reduce their cost.

Scaling Up to the Program Level

Any credible indicator of program-level impacts should have at least two characteristics: (1) it should be an accurate measure of the status of biodiversity, and (2) changes in its status should be reliably attributable to USAID s efforts. Comparable results from the monitoring programs of several site-specific projects might be usefully pooled to provide some measure of their impacts on the status of biodiversity at the national or regional level. But changes in many potential surrogate indicators of the status of biodiversity, such as national or multinational indices of the rates of deforestation, the total number of hectares of forest or wetlands being conserved, or the status of threatened or endangered species most often have multiple causes and cannot be reliably attributed to site-specific USAID-funded conservation efforts.

This difficulty greatly magnifies when one tries to envision standard metrics of impact that might be used equivalently across multiple countries, regions, and ecological zones and types of threats to biodiversity. The author recommends against using such surrogate indices to monitor and measure performance or to report the consequences of USAID s biodiversity program.

INTRODUCTION

Over the past several years, the U.S. Agency for International Development (USAID) has substantially increased its investment in the conservation of biological diversity from $5 million in 1987 to $74 million in 1994 and is now supporting efforts to help over 40 countries protect and sustainably use their biological resources. This growing investment is motivated by the recognition that, across the planet, current patterns of resource use and population growth are perturbing natural ecosystems and diminishing the diversity of species within them at an extremely rapid rate, and at an enormous cost to the long-term environmental and economic health of each country. USAID s investment takes several forms, from support for the reform and strengthening of national environmental policies and institutions, to identification of priority habitats for conservation, to support for training in park protection and management, to assistance for communities living in or near habitats of high conservation value so they may benefit economically by maintaining those habitats in a minimally disturbed form. The ecosystems targeted for conservation are similarly diverse, ranging from coral reefs to montane and lowland tropical forests to the savannah habitats of east and southern Africa.

Many of the participants in this conference face the legitimate and vexing problem of wanting to be able to assess the impact of this investment, to understand just how much biological diversity is actually being conserved as a consequence of U.S. foreign aid. Ideally, you would like to have in place a relatively simple metric, an index of impacts that can be used more or less equivalently across geographic regions, across ecological zones, and across investments of different types so you can inform yourself and others about the broad impact of your programs. The perceived urgency for doing so at this time of increasingly lean Federal budgets is no doubt particularly strong.

My plan in this paper is to first examine the prospects for assessing the impacts on

biodiversity of field-level projects that are financed by USAID that is, projects that are designed to help developing country institutions and local communities develop the capacity to protect and sustainably use their biotic resources in specific sites. I begin at the level of field projects for three reasons. First, a great deal of USAID s financial investment in biodiversity conservation targets the conservation of specific sites. In Latin America, for example, this is the case for the Mayarema project that is working to conserve the Maya Biosphere Reserve in Guatemala; the Sustainable Uses for Biological Resources (SUBIR) project working in the buffer zones of several protected areas in the Ecuadorian Amazon; and the Parks in Peril project working to enhance protection and management of a number of parks throughout the Latin America and the Caribbean. Second, it is at this site-specific level that the evidence of the impact of USAID s investment on biodiversity should be most tangible; you should, in principle, be able to determine whether and to what extent specific sites of high biodiversity value are being better conserved as a consequence of your efforts.

Finally, if the overarching goal is to be able to say something meaningful about the impact of USAID s investment in biodiversity conservation within a nation or a region, then I believe that you must first be able to do so at the specific sites where you are working to help conserve. Otherwise, it will be difficult at best to realistically attribute any changes, positive or negative, in the status of a country s biotic resources to your efforts. Therefore, I will briefly describe some of the issues involved in assessing the impact of field-level conservation projects and examine how three USAID-funded projects in different parts of the world are attempting to monitor and assess the conservation impacts of their work. I will then ask whether these site-specific efforts to monitor conservation impacts can be realistically "scaled up" to feed into broader indicators of the biodiversity conservation impact of USAID s country or region-wide programs.

MONITORING THE ECOLOGICAL IMPACTS OF FIELD-LEVEL PROJECTS TO CONSERVE AND SUSTAINABLY USE BIOLOGICAL DIVERSITY

Imagine that you are supporting a project that is designed to help rural communities on the edge of a lowland tropical forest engge in the sustainable harvesting of some forest products. The goal of the project is to help these communities gain long-term economic benefits from the intact forest and thus increase their incentive to conserve it, rather than convert it to agricultural land or pasture. The forest has substantial value as a watershed and also plays an important role in regulating local and regional climate. Moreover, it is a significant reservoir of biological diversity. That is, it is estimated to contain a very large number of species, the vast majority of which have not yet been identified. Several species resident in the forest are known to be threatened or endangered, and some are also thought to be endemic, existing in that particular forest and nowhere else in the world. Most important, the expanding human population is now severely diminishing the forest s biodiversity by clearing much of the accessible land along its edge for agriculture and by hunting wildlife at unsustainably high levels.

Most of the projects that are attempting to work on issues such as this are consumed with the day-to-day effort of "doing conservation and development" establishing effective relationships with the communities, helping community members develop technical skills and markets for

selling their products, helping them gain secure land tenure, and so on. While the particulars vary from case to case, the project focus is almost exclusively on immediate concerns. Indicators of how the project is doing therefore tend to focus on whether it is achieving practical, short-term objectives; for example, how many community members have been trained in the harvesting enterprise, or, for a park protection project, how many guards have radios and transportation and whether a park management plan has been written and is being implemented.

All of this information is very important, but it does not tell you whether the project s efforts are effectively conserving the site s biological diversity. Indeed, project implementors are often confronted by a profound lack of information on the status of a site s biological diversity and of the primary threats to its conservation. A well-designed program of ecological monitoring, one that directly measures changes over time in key biodiversity components, has two tangible benefits. First, it enables project implementors to engage in "adaptive management;" that is, to identify the primary threats, gather feedback to determine which management actions are working and which are not, and flexibly reallocate resources to focus efforts where they can be most effective. For a project working at a tropical forest park, for example, an effective ecological monitoring program would enable the park manager to know the areas of the park under greatest pressures from settlement or hunting, the population status of heavily hunted species, and whether particular management actions relocating park guards, hiring members of the local communities to serve as guards or naturalists, and so on are effective.

Second, it enables both donors and project implementors to test conservation hypotheses in a manner that can provide broader lessons for how we should be best allocating limited resources to achieve the goal of conserving biodiversity. This is essential, because none of us really knows how to best help developing countries conserve their biotic resources. Rather, we have ideas, informed judgments, and hypotheses. One that is currently widely held, for example, is that local economic development and biodiversity conservation are highly compatible; that, for example, rural communities that gain economic benefits from timber and non-timber products harvested from a tropical forest will in fact be more inclined to protect that forest and the biodiversity within it. But this is a largely untested hypothesis and we don t now have a good handle on whether and under what conditions it may work (Kremen et al. 1994). A number f projects funded by USAID and others are currently trying to conserve biological diversity on this basis. However, it is only if project implementors view themselves as conducting experiments, committed to monitoring the impacts of their work, that we will be able to meaningfully learn from them.

To date, most field-level conservation projects in developing countries have done very little monitoring of their ecological impacts. There are several reasons for this. Monitoring can be fairly expensive, time-consuming, and logistically difficult in the remote sites where so many projects are undertaken. Effective monitoring requires projects to critically evaluate how they are doing, a process that can run up against the often strong incentive to claim success. Also, there are no "cookbooks" no standard set of recipes for what and how to monitor that can be readily applied to the diverse set of ecosystems in which conservation projects are working. Even for conservation work in a given habitat type, a montane forest or a coral reef, the specific things that the project should monitor the indicators of its ecological impact may vary greatly with the

characteristics of the site, with the nature of the threats to its conservation, and with the specific objectives of the project. It also can be a challenge to determine whether some changes for example, the population sizes of key species result from natural variation, local anthropogenic impacts (e.g., hunting or logging), or from larger-scale anthropogenic impacts (e.g,. ozone depletion, altered weather patterns, acid rain) that lie beyond the scope of site-specific conservation efforts (Gaston and McArdle 1994, Phillips and Gentry 1994).

Nonetheless, there is an emerging consensus in the conservation and development community that we have much to gain by monitoring the ecological impacts of biodiversity conservation projects. Several attempts are being made to develop general principles and guidelines for doing so (TNC 1995, BCN 1994, GEF 1992, Swanson 1994). The most prominent is a set of guidelines developed by the World Bank s Global Environment Facility (GEF) for monitoring and evaluating the impacts of GEF biodiversity projects (GEF 1992). These provide project managers with a recommended series of steps to take in developing a monitoring program and outline the types of indicators and sampling techniques that might be used to measure project impacts on different components of the ecosystem. However, the extent to which these guidelines have been followed and their effectiveness have not yet been assessed.

A number of field-level conservation projects funded by USAID are beginning to design and implement ecological monitoring programs. Their monitoring efforts are all in the early stages of development and several are breaking new ground. Below, I briefly sketch the progress to date of three projects, one each in Africa, Asia, and Latin America.

CASE STUDIES

SUSTAINABLE APPROACHES TO VIABLE ENVIRONMENTAL MANAGEMENT

The Sustainable Approaches to Viable Environmental Management (SAVEM) project is a seven-and-a-half-year (FY 1991 98), $40-million effort to help Madagascar conserve its extraordinary and highly threatened endemic flora and fauna. SAVEM is designed to (1) provide institutional support to Madagascar s National Association for the Management of Protected Areas (ANGAP), the lead Malagasy agency responsible for park protection and buffer zone management, and (2) test the hypothesis that local communities will work to conserve natural habitats if they see that habitat conservation enhances their economic and social well-being and they have the opportunity to make decisions about the future of their resources. The project is implementing this integrated conservation and development approach in six of Madagascar s protected areas: Ranomafana National Park, Masoala, Andohahela, Andasibe/Mantadia, Sahamena, and Amber Mountain/Ankarana/Analemera. Several U.S. and Malagasy NGOs are the implementors, with a different set working at each site (see figure 1).

The hypothesis-testing approach of the SAVEM project serves as the driving force behind the development of site-specific ecological (and also social) impact monitoring programs. By far, the furthest advanced is the monitoring work in Masoala, implemented through SAVEM by a consortium that includes CARE, the Wildlife Conservation Society, and ANGAP (L. Gaylord,

pers. comm.). The Masoala Peninsula in northeastern Madagascar contains a large (nearly 300,000 ha) humid lowland rain forest that is coming under increasing pressure from logging, hunting and rice cultivation.

The Masoala project implementors recently completed a detailed study that included the mapping of the locations of villages and village territories, the inventory of selected plant and animal taxa, the quantification of forest product extraction by villagers, the ground-truthing of vegetation types from satellite and aerial photos, and the development of a Geographic Information System (GIS) to integrate and analyze these data (Kremen 1994). They used the results of this effort to develop a proposal for a new Masoala National Park that specifies the park s boundaries, the boundaries of a contiguous and largely forested buffer zone, and a peripheral zone that contains primarily agricultural land with substantial fragments of secondary and primary forest (see figure 2). Within the park, where only tourism and scientific research will be allowed, the project plans to focus on enforcing park regulations and development of management plans to allow tourism. Within the buffer zone, harvesting of forest products for noncommercial uses will be permitted. Within the peripheral zone, the project will work to improve agricultural techniques, encourage community management of forest fragments, and identify marketable forest products that can be sustainably harvested, with the goal of providing villagers with an economic incentive to maintain the larger remaining tracts of forest intact.

The Masoala conservation and development efforts are focussing on three watersheds that extend from the park through the buffer zone and into the peripheral zone. A plan to systematically monitor the ecological impacts of this work has been developed by Dr. Claire Kremen of the Xerxes and Wildlife Conservation Societies (Kremen 1994). A description of the plan follows:

1) Impacts on forest cover and land use. The goal is to assess whether the project is effective in slowing the rate and extent of deforestation and the conversion of primary to secondary forest in the park, buffer zone, and peripheral zones. To do so, a time series of aerial photographs will be taken of each of the three project watersheds and of an equivalent (control) watershed where no project work is taking place. The analyzed photos will provide baseline information before project activities begin and on landscape-level changes at two-year intervals.

2) Impacts on the sustainability of forest product harvesting. The goal is to determine whether forest products collected by villagers for consumptive and commercial uses are being harvested at sustainable rates. Through household surveys and direct observations, baseline information has been collected on the natural densities and annual levels of extraction per household for 19 different species. The project could affect the use of forest products in several ways: by effectively prohibiting their harvesting within the park, by encouraging the use of new resources in the buffer and peripheral zones, by attempting to regulate the harvesting rates of certain products in the buffer and peripheral zones, and by the

Figure 1: Protected Areas and SAVEM Project Sites in Madagascar.
(Source: USAID/Antananarivo)

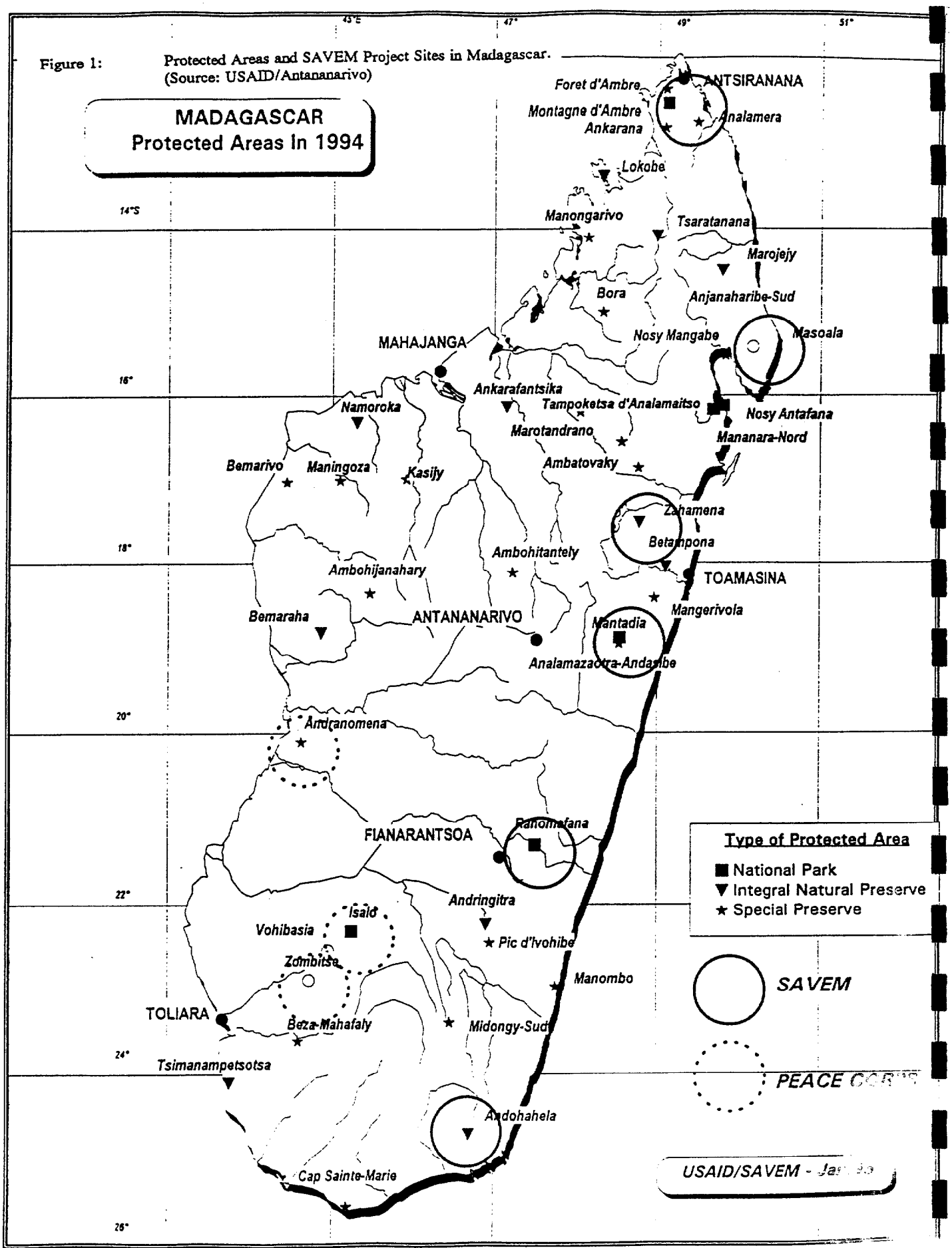

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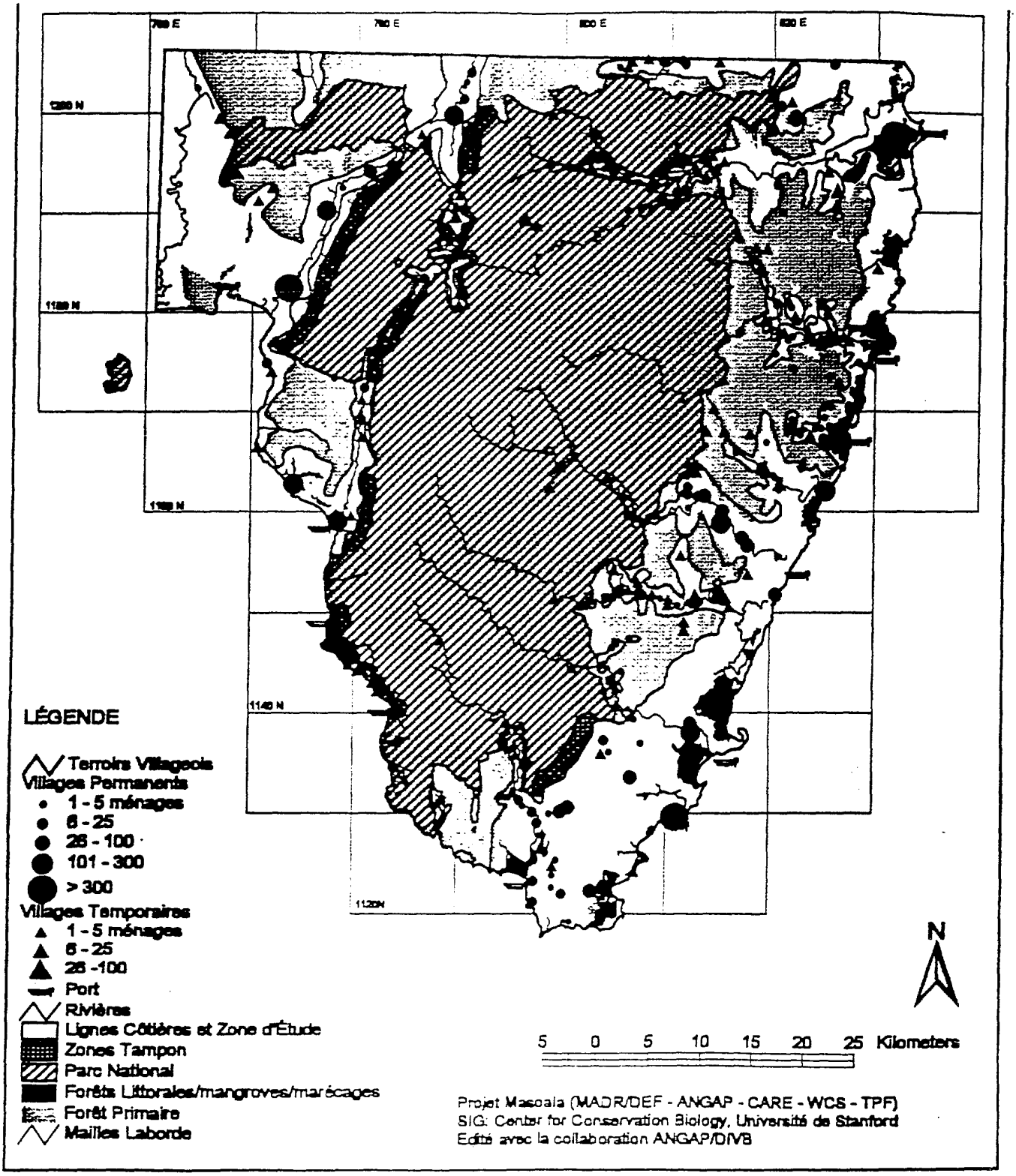
Figure 2: Boundaries of Proposed National Park, Buffer Zone, and Peripheral Zone on the Masoala Peninsula. Developed by the Masoala Project of SAVEM, a consortium that includes CARE, the Wildlife Conservation Society, and the Madagascar National Association for the Management of Protected Areas. (Source: USAID/Antananarivo)



broader project impacts on the economy and demographics of the Masoala region. The abundance and levels of household use of these harvested resources will therefore be measured at regular intervals in park, buffer, and peripheral zone habitats in one project and one control watershed.

3) Impacts on other components of forest biodiversity. To determine whether the project has an impact on the overall levels of biological diversity in the forest, Masoala project implementors plan to monitor changes over time in the species composition and relative abundance of selected indicator taxa. These include two species of lemur, chosen because of their key ecological roles (e.g., pollination and dispersal of seeds), their large territories, and sensitivity to disturbance; and several bird and butterfly taxa. These taxa will be systematically monitored at regular intervals in park, buffer, and peripheral zone habitats in both project and control watersheds.

The Masoala project staff intend to build local capacity to carry out these monitoring studies by hiring and training local community members as research assistants to collect data. Masoala project staff also plan to include several Malagasy researchers as members of the monitoring team. More broadly, a major goal of the SAVEM project is to assist ANGAP develop the technical and financial capacity to oversee monitoring at all project sites beyond the life of the project.

The level of effort that has gone into the Masoala work is impressive, and I suspect that it will produce extremely valuable lessons that could not be gathered without the comprehensive approach to monitoring that this project is taking. The primary reasons why the Masoala project has developed a comprehensive monitoring program are that (1) the researchers working on the project are experienced in ecological monitoring and take the hypothesis-testing approach seriously, (2) the project has been reasonably well-funded, including a $125,000 grant from the USAID-funded Biodiversity Support Program to the Wildlife Conservation Society, and (3) it sits within a larger project (SAVEM) that strongly supports these efforts. SAVEM, for example, has in place a full-time expatriate monitoring and evaluation staff member. It is working to develop the financial and technical capacity within ANGAP to do long-term monitoring and recently supported a workshop to exchange information on monitoring between different project sites. At some of the other SAVEM project sites, the interest and technical expertise necessary to develop and implement a monitoring program is apparently not nearly as strong as it is in Masoala. However, SAVEM project staff hope that the Masoala work will help ignite more focused efforts at these other sites (L. Gaylord, pers. comm.)

BIODIVERSITY CONSERVATION NETWORK

The Biodiversity Conservation Network (BCN) is a $20-million, six-and-a-half-year program established in late 1992 to promote the conservation of biological diversity in several key sites across Asia and the Pacific. The program is administered by the Biodiversity Support Program (a consortium of the World Wildlife Fund, The Nature Conservancy, and the World Resources Institute) with funding from the US Asia Environmental Partnership, led by USAID. BCN has

two central objectives: (1) to support efforts in each site to develop community-based enterprises that depend upon maintaining minimally disturbed habitats for their long-term success, and (2) to assess the effectiveness of this community enterprise-oriented approach to biodiversity conservation (BCN 1994). Support is provided through competitive grants to universities, NGOs and other institutions; thus far, six of an estimated 18 three-year implementation grants have been awarded. Current grants range in size from $321,000 to $899,000, with grantees contributing additional funds from other sources. Supported projects work in a diverse set of habitats that include coastal marine, lowland rain forest, and montane ecosystems. They are helping to develop community-based enterprises that range from marine and terrestrial ecotourism to the harvesting of timber and non-timber forest products.

Similar to the SAVEM project, but highly unusual for most projects working to marry conservation and rural development, the goal of the BCN is not to demonstrate that this approach is effective, but rather to explicitly assess whether (and under what conditions) it may be effective. This is an important distinction. This is because, as noted above, the idea that communities that gain economic benefits from biological resources will act to sustainably use and conserve those resources and the ecosystems upon which they depend is a highly attractive but largely untested hypothesis. Indeed, the over harvesting of biotic resources ranging from fish to timber to non-timber products is extremely widespread, and it is essential to understand the ecological, social, and economic conditions favoring sustainable use if the community enterprise approach to biodiversity conservation is to be successful.

Also similar to SAVEM, this explicit focus on hypothesis-testing drives BCN s emphasis on monitoring the impacts of each site-specific project. The goal is to do so in a way that makes sense at each site and allows meaningful comparisons among sites. Monitoring is the primary responsibility of each grantee, with the BCN staff setting basic standards, providing guidance and oversight, and promoting information exchange among projects. Grantees are expected to work closely with members of the local communities to systematically monitor and report on the impacts of their project on biological diversity, on the socioeconomic status of the community with which they re working, and on the financial viability of the developing enterprise. Doing so takes considerable time, effort, and financial resources. An estimated 30 to 50 percent of each implementation grant is devoted to monitoring project impacts (BCN 1994).

The BCN staff have drafted a general monitoring protocol that provides grantees with a broad set of indicators that should be monitored and recommended techniques for doing so in the field. Grantees are supposed to use these as guidelines for developing their own site-specific monitoring plans. They are asked to monitor impacts at several ecological levels; for example, the impacts of the enterprise on the specific resource, such as timber or a non-timber forest product; the impact on other key species in the affected habitat, such as birds or mammals that might be sensitive to harvesting-associated disturbance; and larger-scale changes on the ecosystem, such as the extent of forest cover. The BCN is also considering setting some more specific basic standards; for example, requiring all grantees to develop a baseline map of the affected habitat and a list of known species (N. Salafsky, pers. comm.). Thus far, the BCN is not providing grantees with specific standards for sampling protocols or for analyzing and interpreting results.

How is this working in practice? The available information is sketchy, largely because the

work is so new. Of the six projects thus far receiving implementation grants, the oldest have been operating for only about 18 months. None of the site-specific monitoring programs are yet fully in place. One challenge the BCN faces is that the three-year duration of the implementation grants provides an extremely short window of time within which to gauge the economic or ecological sustainability of the community enterprises. It will therefore be important to encourage grantees to develop the local capacity to continue monitoring the enterprises and their impacts well beyond the three-year funding period. When the results are in, we should know a great deal more about the conditions under which local communities whose livelihoods depend on biological resources are best able to sustainably use those resources and the habitats upon which they depend.

PARKS IN PERIL

The Parks in Peril (PiP) project is a seven-year (FY 1990 97), $14-million effort to help several Latin American and Caribbean governments and private organizations develop and manage protected areas. Additional matching funds are provided by host country governments and by The Nature Conservancy (TNC). TNC designed the project and is implementing it under a cooperative agreement with USAID. As of mid-1994, Parks in Peril was working in 12 countries, focusing its efforts on 26 protected areas that contain important biological resources and have been under considerable pressure from resource mining, colonization, or other human activities (ENRIC 1994). The project s primary objectives are to improve on-site park protection and management, to encourage local support for park protection by assisting compatible development, and to insure long-term financial sustainability for the parks. A major goal of the project is to "graduate" parks over a period of years from the use of USAID funding to other regional, national, or international sources of support.

TNC and its Parks in Peril partners are beginning to develop programs to monitor the ecological impacts of their conservation efforts. In contrast to the two projects described above, there are no overarching conservation or park management hypotheses that the project intends to test. Rather, their primary objective is to use monitoring as a site-specific management tool, providing information for park managers to better assess the relative importance of different threats and the effectiveness of different management actions TNC 1995).

Efforts to monitor ecological change at Parks in Peril sites are at an early stage. The plan is to focus initially on improving current monitoring programs at a subset of selected parks. This will be done collaboratively, with TNC providing financial and technical assistance, but with strong input from local NGO and government partners and local communities (TNC 1994, J. Shopland, pers. comm.) TNC plans to then transfer lessons about effective monitoring strategies to other sites in the Parks in Peril network.

Ecological monitoring is apparently furthest along in the El Triunfo Biosphere Reserve, a 119,000-hectare mosaic of montane and mid-elevation tropical forest interspersed with agricultural land in the Sierra Madre de Chiapas, Mexico. El Triunfo contains several regionally important watersheds, an unusual mixture of Nearctic and Neotropical flora and fauna that includes numerous endangered and regionally endemic species, and cloud forest and

tropical deciduous forest ecosystems that are globally rare and of considerable conservation value. Major threats to the Reserve include colonization, logging, and forest clearing for agriculture, fires, contamination of watercourses, and unsustainably high levels of hunting (Shopland 1994). Current monitoring efforts include the use of aerial videography to map vegetation and population censuses of selected endangered fauna. Over the past few years, TNC staff have worked with counterpart staff from the Instituto de Historia Natural in Chiapas to develop a detailed set of recommended priorities for ecological monitoring at El Triunfo. These include recommendations for monitoring changes over time on total forest cover (e.g., rate and pattern of deforestation through analysis of aerial and satellite photos), the status of several key plant and animal species, the levels of human use of wild plant and animal products, and so on.

Limited financial resources may pose a major obstacle constraining the further development of monitoring programs at El Triunfo and other Parks in Peril sites. As of January 1994, for example, financial resources specifically dedicated to monitoring in El Triunfo consisted of the salary of the head of the monitoring program and an annual budget of about $10,000 provided through Parks in Peril. It is hard to imagine that this will be sufficient, particularly for the initial setup phase that will require both equipment and technical input. The use of satellite imagery and GIS to measure landscape-level changes in forest cover, for example, require an estimated start-up cost of about $50,000 (J. Shopland, pers. comm.)

OBSTACLES TO THE IMPLEMENTATION OF EFFECTIVE ECOLOGICAL MONITORING PROGRAMS

SHORT PROJECT TIME SCALE

Biodiversity conservation projects have relatively short lives. Those being implemented under SAVEM and the BCN, for example, are scheduled to last for 2 to 5 years. This is an extremely short time frame within which to be able to meaningfully determine project impacts. Consider, for example, the problem of determining whether populations of heavily hunted birds and mammals within the project site are being effectively aided by an increase in the number of local community members working as park guards or naturalist guides. Over the time scale of the project it will be difficult to know whether observed changes in their populations are a consequence of project activities or whether these changes reflect natural variation in their numbers. Moreover, the most important measure from a conservation perspective is whether these populations and the forest are effectively conserved after the project has been completed, when the project s funding is no longer being provided. This is, after all, the critical measure for determining whether the changes facilitated by the project are truly sustainable.

Biodiversity conservation programs and ecological monitoring are inherently long-term efforts. A central challenge, therefore, is to ensure that projects help build local capacity to both carry out the conservation and development work beyond the end of the project s funding and to continue monitoring the impacts of their work on the ecosystem.

LIMITED FUNDING

The expense involved in monitoring the ecological impacts of a project can be considerable, both in terms of equipment (e.g., GIS, aerial videography, vehicles), time, and expertise. Those projects that are implementing comprehensive monitoring programs are reasonably large and well-funded and have given monitoring a high priority. Not all field-level conservation projects can afford to do so, however, and perhaps not all should. The TNC approach of focusing monitoring efforts initially at a few selected sites makes a great deal of sense, given limited financial resources.

One way to decrease the competition for funds between ecological monitoring and other project activities is for implementors to develop monitoring plans at the earliest stages of a project s inception. In this way, a financially realistic scheme can be developed and tailored to the available funding for the project. Also, costs may go down somewhat over time as techniques and priorities for monitoring become better developed and are shared among different implementors. It is important for USAID to avoid unfunded mandates requirements for reports from implementors on a project s effectiveness in conserving biodiversity that demand monitoring programs that the Agency does not sufficiently fund.

LIMITED TECHNICAL EXPERTISE

Monitoring programs require user expertise in ecological science to help identify questions and indicators, to design sampling methods, to supervise field work, and to analyze and interpret collected information. They require the participation of individuals with these skills and knowledge and a willingness and ability to often work outside of their discipline. A ecologist trained in mammalogy, for example, may need to also be able to supervise aerial surveys of landscape-level changes in forest cover.

Because monitoring programs for field projects are at such an early stage of development, no standard set of basic techniques has been developed. Moreover, because numerous projects around the world are currently grappling with this issue more or less independently and the information transferred between projects working within and across regions is low, there is potentially a great deal "wheel reinventing" now going on. USAID can substantially encourage the transfer of lessons across projects by sponsoring a workshop that would bring together individuals and institutions working on monitoring ecological impacts in different sites.

INCENTIVES TO DEMONSTRATE SUCCESS

A final obstacle to effective monitoring of ecological impacts is that a great many individuals and institutions working in conservation have a strong incentive to demonstrate the success of their work in achieving conservation goals. There is, for example, an obvious incentive to report positive results to donors such as USAID (just as USAID has a strong incentive to report positive results to Congress) and to downplay efforts that don t seem to be working well. For monitoring to be effective, though, one has to take a more neutral approach; that is, recognizing the experimental nature of most conservation efforts and valuing the lessons from less successful efforts as much as from positive results. Unfortunately, the lessons will tend to be qualitative, and not fit neatly into prepackaged indicators of project (or program) impact. I believe, however, that

USAID can do a great deal to enhance the transparency of conservation impact reporting by strongly supporting the thoughtful measurement of site-specific impacts, and by providing incentives for implementors to report the lessons both positive and negative, qualitative and quantitative of these ongoing experiments.

To summarize, the central features of efforts to monitor the ecological impacts of USAID-funded projects that are designed to conserve biological diversity in specific sites are that they are very new and that they provide extremely powerful tools to adaptively manage biodiversity conservation projects and test hypotheses about conservation and sustainable use. I suggest that effective monitoring programs will generally have the following characteristics:

- The input of substantial ecological expertise and financial resources at the earliest stages of the project;

- Be tailored to local conditions, since there are no standard sets of "cookbook" indicators and techniques that can be equivalently applied across different ecosystems and threats to their conservation;

- Monitor indicators that can reliably reflect project impacts according to multiple ecological scales, since changes at one scale (e.g., changes in forest cover) do not provide clues about impacts on biodiversity according to other scales (e.g., population sizes of hunted species);

- Establish baseline conditions and, where feasible, monitor changes in biodiversity at equivalent control sites that are unaffected by project activities;

- Systematically assess the link between observed changes in biodiversity, project activities, and other potential causes of change; and

- Develop the local financial and technical capacity to continue monitoring impacts beyond the life of USAID project funding.

I believe that current efforts to monitor the impacts of field-level biodiversity conservation projects are extremely important. Unfortunately, they are often also the types of activities that are most likely to be cut back when time and project budgets become limited. I recommend that USAID strongly encourage ecological monitoring programs by undertaking the following actions:

- Provide sufficient financial investment in site-specific projects to support their monitoring needs;

- Provide a strong emphasis on adaptive management and hypothesis-testing in biodiversity conservation projects, thereby decreasing incentives for projects to demonstrate success; and

- Provide support for an international workshop that brings conservation practitioners together to compare ecological monitoring techniques; this will minimize the level of "wheel-reinventing" now going on as conservation projects work to put monitoring programs into place.

Collectively, these steps should greatly increase the effectiveness and may ultimately substantially decrease the cost of site-specific biodiversity conservation projects.

SCALING UP: MONITORING USAID PROGRAMS TO CONSERVE BIOLOGICAL DIVERSITY

Comparable monitoring results from several site-specific projects might be usefully pooled to provide measures of national or regional impacts on biodiversity of USAID s total program support for biodiversity conservation. However, this pooling of site-specific impacts would not capture the potentially broader impacts of related USAID actions; for example, national environmental or land tenure policies that also affect biodiversity. It would also not inform efforts to describe current or past impacts, since monitoring programs are just beginning. There is therefore often a great incentive to use surrogate indicators of changes in the status of biodiversity at the national or regional level (e.g., changes in the rates of deforestation, in the total number of hectares of forest or wetlands that are being conserved, in the population sizes of endangered species) as indices of USAID s program-level impacts.

Any credible indicator of USAID s program-level impact on biodiversity should have, at minimum, two characteristics: it should be an accurate measure of the status of biodiversity, and changes in its status should be reliably attributable to USAID s efforts. There are, unfortunately, several considerable challenges to overcome in selecting metrics that share these characteristics. The greatest challenge is that changes in national or regional indices of the status of biodiversity usually reflect multiple causes; it is difficult to envision how one can reliably attribute observed national-level changes to USAID biodiversity conservation efforts.

The deforestation/biodiversity habitat loss relationship is illustrative. It would be terrific to know whether USAID efforts have had a measurable impact on the rates of deforestation in a country. But for most countries, changes in the rate of deforestation will be affected not only by USAID=s biodiversity conservation efforts, but also by the conservation work of other bilateral and multilateral donors, the efforts of USAID and others in different sectors (for example, in the education of women), market changes in the price of timber or cattle or bananas, changes in U.S. and European economies that affect the number of individuals who can afford to spend their vacations as tropical ecotourists, and so on. Moreover, there is no obvious "control" to which these rates can be compared and no way of knowing what they would have been if USAID efforts had not been made. If, for example, a country s rate of deforestation increases over time, this doesn=t on the surface look like a positive impact. On the other hand, it perhaps would have increased at a higher rate had USAID s conservation program not been in place.

This difficulty greatly magnifies when one tries to envision standard metrics of impact that

might be used in an equivalent manner across multiple countries, regions, ecological zones, and threats to biodiversity. I cannot conceive of any broad program-level indicators of impact that would share the characteristics of accuracy and reliability of attribution to USAID=s conservation programs. Some may argue that ease of explication to a public audience is a more important indicator characteristic than is, for example, reliability of attribution. But I would suggest that it may be far better to educate USAID s public audience on the diverse site-specific impacts of USAID conservation programs, on the relatively small level of financial resources that USAID is investing globally in biodiversity conservation, and on the direct (and diverse) benefits that Americans gain by supporting these efforts.

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